



March 2008

Master of Science & Doctor of Philosophy in Biology, University of Washington

Introduction

The University of Washington (UW) seeks approval to establish a graduate program in biology. In 2003, the Departments of Botany and Zoology merged with the undergraduate biology program to form a new Department of Biology. The proposed program would consolidate and replace existing Botany and Zoology MS and PhD programs, which would be terminated.

If approved, the proposed program would serve full-time and part-time students at the Seattle Campus, enrolling 100 FTE students beginning fall 2008 and growing to 150 FTE students by 2010. It would emphasize the doctoral degree, with no (or very few) students admitted in pursuit of a terminal MS degree. It would prepare students for academic careers in research universities (~50 percent) or colleges (~25 percent), as well as careers in government agencies, non-governmental organizations, or industry (~25 percent.)

Relationship to Institutional Role and Mission and the Strategic Master Plan for Higher Education

According to the "UW Role and Mission Statement", UW's primary mission is the preservation, advancement, and dissemination of knowledge. The proposed program would support UW's role and mission because its graduate students work with faculty on research, serve as teaching assistants for undergraduate biology courses, and provide service to the community through activities such as mentoring middle school science teachers.

In addition, the proposed program would support the *Strategic Master Plan for Higher Education* by expanding access to postsecondary degrees in a field where research can have a great impact on economic prosperity, innovation and opportunity.

Diversity

In January 2007, the Department of Biology adopted the following diversity statement, which outlines active measures to recruit and retain faculty, staff, and students from underrepresented groups:

- Establishment of a diversity committee with oversight responsibility for diversity issues;
- Inclusion of a diversity committee representative on each key departmental committee;
- Ongoing diversity training for departmental leaders;
- Quarterly meetings of a department-wide diversity interest group, “B-Diverse”;
- Review of best practices for identifying potential hires from underrepresented groups at the beginning of every faculty search;
- Use departmental seminar series as a venue for possible faculty recruitment by inviting faculty from under-represented groups to give seminars;
- Use fellowships and research assistantships to recruit graduate students from underrepresented groups;
- Participation in the interdepartmental biomedical minority recruitment task force;
- Develop awareness of diversity within the discipline through efforts such as the development of a graduate course called “Uncommon Leaders,” in which students profiled a variety of biologists distinguished by the high quality of their science, and their diverse backgrounds in terms of ethnicity, gender, and disability;
- Sponsorship of an annual Mindlin lecture that brings to UW’s Kane Hall distinguished biologists from underrepresented groups; and
- Evaluation of diversity efforts annually, and revising as needed.

Program Need

The proposed program would respond to the needs of students, employers, and community stakeholders, and would not unnecessarily duplicate existing programs in the state.

Currently, about 200 prospective students per year apply for admission to the Botany and Zoology PhD programs, but only about 30 students per year are offered admission. This suggests a very high level of student demand for the existing programs, and it seems reasonable to use that as a proxy for student demand for the proposed program.

In addition, employers in three of Washington’s largest industries - agriculture, forestry and fisheries - depend on the development of an increasingly sophisticated understanding of biology. Moreover, growth in “knowledge sector” industries, such as the biotechnology industry, requires leaders and workers who are at the forefront of biological research. Furthermore, the entire health care system, from consumers to physicians, benefits from biological research. Finally, environmental issues, from climate change to invasive species, present ongoing challenges to the community that need to be addressed by voters and policymakers informed with the best

available science. The proposed programs would produce graduates who would help employers and community stakeholders meet these needs.

Although several universities¹ in the state offer MS degrees in biology, none offers a doctoral degree². Thus, the proposed program would not unnecessarily duplicate existing programs.

Program Description

The consolidation of the botany and zoology degrees reflects departmental recognition that the future of the biological sciences lies with the interdisciplinary study of living things at every level, from the molecule to the ecosystem. At the most fundamental level of biological organization - cells and molecules - distinctions between “plant” and “animal” nearly disappear; and at higher levels of organization such as ecosystems, plant-animal interactions are crucial. Thus, a shift away from taxonomically related degrees makes sense.

The proposed program aims for students to acquire and demonstrate research competence, communication skills, breadth of knowledge, and teaching ability in the biological sciences. These objectives would apply to students, whether they complete the PhD degree or leave with the MS degree. The distinguishing feature of learning outcomes for the two degrees is that the PhD degree recognizes a higher level of achievement.

In order to be admitted to the program, students would have to hold a baccalaureate degree from an accredited college or university in the U.S. or its equivalent from a foreign institution; earned at least a 3.0 or B grade point average in the most recent two years of study; take the Graduate Record Exam (GRE); and meet UW Graduate School language proficiency requirements. In addition, the program would use the following guidelines for admission: a 3.7 undergraduate GPA, a GRE verbal score of 604 (85th percentile), and a GRE quantitative score of 695 (75th percentile.) Applicants would be expected to have substantial prior research experience, and submit strong letters of recommendation from their research supervisor(s).

Once admitted, students would be required to take 90 credits for the PhD degree program, of which 36 credits would qualify the student for an MS degree. The curriculum would be tailored to the needs of each student, as determined through consultation between the student and his/her supervisory committee. In addition, satisfying UW Graduate School requirements, PhD students must:

- Have or obtain an academic background equivalent to that required of students receiving a BS degree from the department;
- Complete a one-quarter, two-credit “Graduate Professional Life” course;
- Attend weekly departmental seminars;
- By autumn quarter of the second year, request appointment of a supervisory committee, which would meet at least annually;
- By spring quarter of the second year, take a general examination;

¹ Central Washington University, Eastern Washington University, Walla Walla University, Washington State University, and Washington State University-Tri-Cities each offer a MS degree in Biology.

² However, Washington State University does offer PhD degrees in Botany and Zoology.

1. By spring quarter of the third year, present to the supervisory committee a formal proposal outlining planned research;
2. Hold an appointment as a teaching assistant for at least three quarters while in residence;
3. By the beginning of the quarter of anticipated graduation, request appointment of a dissertation reading committee;
4. Successfully defend the dissertation at the final examination; and
5. Obtain appropriate signatures on the dissertation's cover page prior to submitting it to the Graduate School.

Master's students must complete requirements 1-4 above, take a final examination, and (for thesis option students) successfully defend a master's thesis.

Student learning outcomes would be measured through exams, research, written reports, and papers. In addition, the annual supervisory committee meetings would holistically assess learning outcomes by giving the student an opportunity to make written and oral presentations of research; providing a forum for the exchange of ideas surrounding the student's research; and giving the faculty an opportunity to provide written and oral feedback on student progress. These meetings would provide feedback and guidance for the student and inform faculty about the overall success of the graduate program itself.

The program itself would be further assessed through the following:

- Review of current departmental practices to determine the program's success in terms of student mentoring and student progress;
- Comparison of student progress benchmarks with other programs around the country;
- Measurement of level of research support;
- Student surveys;
- Monitoring of student professional output (papers, presentations, public service);
- Annual graduate student focus groups;
- Exit surveys; and
- Monitoring of the placement of graduate students in post-doctoral training, faculty positions, government, not-for-profit, or industry positions.

The program assessment information would be used to refine the program as necessary; for example, by adding courses for which survey results indicate a need.

Program Costs

The proposed program would enroll 100 FTE students in the first year, growing to 150 FTE students by the third year. To implement the program, the Department of Biology has budgeted 1.85 FTE for administrative staff and 42.0 FTE for faculty (32.0 tenure track FTE plus 8.0 instructor FTE). The proposed program would use existing office space and library resources, so the budget excludes those items. It would be funded by a combination of state FTE, grants, sponsored research, royalties, and endowments.

With an entering class of 100 FTE, the total cost of instruction³ for the first year of the program would be \$3,894,882, or \$38,949 per FTE. At full enrollment of 150 FTE in the third year, the total cost of instruction would be \$4,448,183, or \$29,655 per FTE. This falls within the range of average cost per FTE for graduate students majoring in sciences at research institutions.

According to the HECB's *2005-06 Education Cost Study (July 2007)*, the direct cost of instruction per average annual sciences graduate student FTE at research institutions ranged from \$15,420 at the University of Washington to \$40,660 at Washington State University, Tri-Cities. Although the average cost per FTE is closer to the high end of the range than the low end, it is noteworthy that the student/faculty ratio of the proposed program is significantly lower than corresponding ratios in the cost study.

External Review

Two external reviewers reviewed the program: Dr. Kathleen Smith, Professor and Director, National Evolutionary Synthesis Center, Department of Biology, Duke University; and Dr. Joann Otto, Professor and Chair, Department of Biology, Western Washington University.

Both reviewers strongly endorsed the proposed program, commenting on the high quality of its faculty and current botany/zoology graduate students. Smith noted that the proposed program would represent an excellent balance of independence and guidance, appropriate for the quality of students entering the program; and that the program's meetings, committee formulation, and teaching requirements would all be appropriate and comparable to other programs. Otto noted that the proposed program's academic standards and degree requirements would be high, reflecting a rigorous program. She also noted that the organization of the program was appropriate, and she commended several specific design features, such as written feedback on students' research proposals.

Smith identified three issues critical to the ability of the department to retain its current strong position: sufficient financial support from the university; continue to have top-notch leadership; continue to recruit the very best faculty. Program planners responded that the first two issues would have to be addressed at the university level, rather than the departmental level; however, the department would be recruiting three to four new faculty per year for the next several years.

Otto made a couple of recommendations concerning committee makeup. First, she recommended either a committee, other than the supervisory committee, administer the general exam, or that one to two additional committee members from different biology sub-disciplines be added to the general exam supervisory committee in order to ensure that it tests breadth of knowledge. Second, she recommended that the department consider having a committee member, other than the major professor, chair the supervisory committee to ensure objectivity. Program planners responded to the first recommendation by explaining that the department is very integrative, with broadly trained faculty members and a departmental culture of broad-based general exams. Program planners responded to the second recommendation by explaining that, despite variation across departments, most UW departments use the committee chair model used by the Department of Biology.

³ Cost of instruction = total cost (\$5,128,460 during first year; \$6,070,195 at full enrollment) less cost of teaching assistant and research assistant salaries & benefits (\$1,233,578 during first year; \$1,622,012 at full enrollment.)

Otto also noted that, for such a large program, the program director's time budget seemed low and that there did not appear to be sufficient staff support. Program planners responded that the budgeted program director administrative effort was approximately correct over the course of a year, the program assistant is highly experienced, and many routine tasks have been made Web-based, requiring less time.

Finally, Otto noted that growth will require a substantial increase in funding for teaching assistant positions, and that university commitment for this was not clear. Program planners responded that Biology is one of UW's largest programs and has never been denied requests for additional teaching assistant support for undergraduate courses.

Staff Analysis

The proposed program would support the *Strategic Master Plan for Higher Education* by expanding access to a field where research can have a great impact on economic prosperity, innovation, and opportunity. Moreover, the proposed program would support UW's role and mission because its graduate students work with faculty on research, serve as teaching assistants for undergraduate biology courses, and serve the community. Furthermore, it would implement an excellent diversity plan.

The proposed program would respond to student need by providing students the opportunity to enroll in a graduate program providing greater interdisciplinary opportunity than the existing botany and zoology graduate programs and accommodate 50 percent more students at full enrollment. In addition, the proposed program would respond to employer and community need because the state's economy is highly dependent on industries that have biology as their basis. The research done by students and graduates would not only contribute to the understanding of biology underlying these endeavors, but also inform policy regarding pressing environmental issues.

Program graduates would benefit from the flexibility of its curriculum and the rigor of its general exam, supervisory committee, research proposal, and dissertation components. Most courses would be taught by full-time tenure-track faculty, whose quality was praised by both reviewers. Both reviewers strongly recommended approval of the proposed program.

Based on the observations above, HECB staff concludes that the program would offer high quality at a reasonable cost. In addition, it would benefit students, employers, and the community without unnecessarily duplicating existing programs.

Staff Recommendation

After careful review of the proposal and supporting materials, staff recommends approval of the MS and PhD programs in Biology at the University of Washington. The HECB's Education Committee discussed the proposal during its March 3, 2008 meeting and recommended approval by the full Board.

RESOLUTION 08-06

WHEREAS, The University of Washington proposes to offer a Master of Science and Doctor of Philosophy in Biology; and

WHEREAS, The program would consolidate and replace existing Master of Science and Doctor of Philosophy degrees in Botany and Zoology; and

WHEREAS, The program would respond to student, employer and community need by providing interdisciplinary graduate study in a field that underlies industries important to Washington's economy and that informs policy regarding environmental issues; and

WHEREAS, The program's graduates would benefit from the flexibility of its curriculum and the rigor of its general exam, supervisory committee, research proposal and dissertation components; and

WHEREAS, The program has strong support from external reviewers; and

WHEREAS, The program would not be unnecessarily duplicative of existing programs;

THEREFORE, BE IT RESOLVED, that the Higher Education Coordinating Board approves the Master of Science and Doctor of Philosophy in Biology at the University of Washington effective March 19, 2008.

Adopted:

March 19, 2008

Attest:

Bill Grinstein, Chair

Roberta Greene, Secretary